

on the subject. He finds, *inter alia*, that in the case of a compound insulating plate between two armatures, the electrification of the two extreme plates is the same as that of a single plate (*i.e.* positive on the side of the positive armature, negative on the side of the negative), and the *persistent* electrification of the intermediate plates is also the same; but at the moment of separation these plates may appear positive and negative on both their faces.—M. Righi contributes a mathematical note on the laws of electromotive forces, and there is the usual amount of matter abstracted from other serials.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, Dec. 9.—On the Development and *Lepas fascicularis* and the "Archizoëa" of Cirripedia, by the late R. von Willemoes-Suhm, Ph.D. The author shows that the *Archizoëa gigas* of Dohrn is the nauplius of *Lepas australis*, a form closely allied to *L. fascicularis*. The life history of the latter is described.

Preliminary remarks on the Development of some Pelagic Decapoda, by the late R. von Willemoes-Suhm, Ph.D. The genera described are *Amphion*, *Sergestes*, and *Leucifer*. The first passes through a true Zoëa stage, *Amphion* itself being, as Dohrn has shown, adult. The larvæ of *Leucifer* and *Sergestes* pass through an *Amphion* stage. The form *Elaphocaris* of Dohrn is proved to be the larva of a *Sergestes*. The form *Erichthina* of Dana is proved to be the larva of a *Leucifer*.

Dec. 16.—On the Structure and Development of the Skull in the Batrachia, by W. K. Parker, F.R.S. The author makes some corrections in his memoir on the skull of the frog, specially showing that the hyoid arch does not coalesce with the mandibular. The skull of *Dactylethra* and *Pipa* are described. The indications of vertebral segmentation in the cephalic part of the notochord are demonstrated in a manner which has much theoretical interest in relation with the theory of Goethe and Oken.

On the development of the spinal nerves in Selachians, by F. M. Balfour, B.A. The author shows that both the roots of the spinal nerves arise as outgrowths from the involuted epiblast of the neural canal, the posterior first, and by the more complicated process.

Chemical Society, Dec. 16.—Prof. Abel, F.R.S., president, in the chair.—Dr. C. R. A. Wright read a paper by himself and Mr. G. H. Beckett, on narcotine, cotarnine, and hydrocotarnine (Part iii.), in which the authors brought forward experimental evidence of the constitutional formula for hemipinic acid, opianic acid, and meconin.—Dr. H. E. Armstrong then gave an account of researches by Mr. Harrow and himself, on the action of alkaline sulphites on the haloid derivatives of phenol, and on the action of nitric acid on tribromophenol.—Mr. E. Neison subsequently made a communication on the sebatates of the alcohol series, after which papers were read by the Secretary, on the compounds of ether with anhydrous metallic chlorides, by Mr. P. P. Bedem, and observations on variations in the composition of river waters, by Mr. J. Andrews.

Royal Astronomical Society, Dec. 11, 1875.—Prof. Adams President in the Chair.—Mr. Burton read a paper on the Southern nebule 30 (Bode) Doradus and the nebule about η Argus. Mr. Burton had while stationed at Rodriguez on the Transit of Venus Expedition made drawings of these rebule with a 12½ inch silver on glass reflector, and on his return had compared them with Sir John Herschel's drawings. After a careful comparison he was not disposed to think that there had been any great change in either of the nebule since the date of Sir John Herschel's observations.—Mr. Ellery, of the Melbourne Observatory, described the observations which they had made of the same nebule with their great Melbourne 4-feet reflector. He was inclined to think that rapid change could be traced not only in the details of the nebule but also in the relative positions and magnitudes of the stars which appeared to be involved in them.—Mr. Ellery also read a paper on the results of some experiments with Huygen's parabolic pendulum for obtaining uniform rotation. The instrument he had used consisted of a heavy weight or bob attached by a thin flexible band of watch-spring steel to the upper part of a piece of metal cut into the form of the evolute of a parabola. This was attached to the upper part of a revolving axis so that the contrivance formed a conical pendulum, in which when the rate of motion was increased the bob or pendulum flew away from the axis and wound the watch-

spring band round the evolute of the parabola. He found that with this contrivance a very uniform rate of motion was obtained, and it seemed to be independent of the weight which was placed on the bob of the pendulum and of variations in the driving power used.—A paper by Mr. With on the structure of Coggia's Comet was read. On the night of the 8th July, 1874, an oscillatory motion of the fan-shaped jet in front of the nucleus was observed. The fan seemed to tilt over from the preceding towards the following side and then for an instant appeared sharply defined, then it became nebulous and all appearance of structure vanished. These pulsations and appearances of structure occurred several times at intervals of from three to eight seconds.—Mr. Ranyard read a paper on the duplicate structure of Coggia's Comet. He showed two drawings each made on July 14, 1874, the one by Mrs. Newall with the great refractor at Gateshead, and the other by Mr. With at Hereford. Both drawings showed that on that evening there were two faint parabolic arcs, which intersected one another in front of the nucleus. The axes of the arcs were parallel to one another, and were separated by a distance of about 1'. During the earlier evenings of July the parabolic arcs within the envelope of the comet had been drawn by several observers as double and overlapping, but the axes of the two sets of parabolic arcs were much less separated than those of the arcs visible on the evening of the 14th. Mr. Ranyard suggested that possibly a disruption was going on similar in character to the disruption which took place in Biela's comet as it approached perihelion in 1846.—Father Perry showed some photographs of the transit of Venus which had been sent to him from Manila. They appeared to show the body of Venus projected on a bright back-ground outside the sun's limb. It was suggested, however, from other evidence, that the photographs must have been taken from drawings. Lord Lindsay and Mr. Brothers, after an examination of the photographs, both inclined to the latter view.

Meteorological Society, Dec. 15.—Dr. R. J. Mann, president, in the chair.—William Ellis, F.R.A.S., Kaufmann J. Marks, Thomas Read, and Philip Wright, F.C.S., were elected Fellows of the Society. The following papers were read :—On the registration of sunshine, by R. H. Scott, F.R.S. This paper is on the continuous record of sunshine and rainfall obtained at Kew for September 1875; the latter by Beckley's rain-gauge, the former by a method originally proposed by Mr. J. F. Campbell, of Islay, F.G.S. This consists in the use of a sphere of glass to concentrate the sun's rays, and a strip of cardboard is placed on a frame concentric with the sphere and distant from it by its own focal length. The sun when it shines burns a hole in the cardboard, the length of the trace being regulated by the duration of the sunshine. It remains to be proved whether such a record is of real practical value, as it affords no measure of the heat of the sun.—On the rainfall at Calcutta, by R. Strachan. These observations were made at the Office of the Surveyor-General, and extend over a period of twenty-eight years, viz., from 1847 to 1874. The most rain falls in July, but the heaviest downfalls are most frequent in June, and heavy downfalls are more frequent in August than in July. The greatest number of days of rain is in July, but the number is almost the same for August. December has the least frequency and amount of rain. The dry season includes November to April, during which on an average 6'04 inches of rain fall, on 12 days out of 181, or 1 out of 15 days. The wet season is from May to October inclusive, during which 61'60 inches of rain fall, on 84 days out of 184, or about 1 in 2 days. There is therefore ten times as much rain in the wet season as in the dry, and nearly seven times as many rainy days. The mean annual rainfall is 67'64 inches on 96 days.—On the use of the rotatory thermometer (*Thermomètre fronde*) on board ship, by R. H. Scott, F.R.S. This paper showed that the mean of 76 days' observations made by Capt. Heggum, of the *Roselle*, on a voyage from Liverpool to Calcutta only differed by $-0\cdot4$ from the mean of the observations made in the ordinary way.—On the moon's influence in connection with our extremes of temperature, by George D. Brumham.—Mr. Scott exhibited a complete set of instruments, with thermometer screen, &c., as used at the Russian meteorological stations.

Anthropological Institute, Dec. 14.—Col. A. Lane-Fox, president, in the chair.—Mr. M. J. Walhouse read a paper on the belief in Bhutas—devil and ghost—worship in Western India. Although the lower castes and classes in India acknowledge and reverence the Brahminical gods, their familiar household cultus is much more especially addressed to inferior super-

natural beings analogous to the evil spirits, devils, ghosts, and goblins of European superstition. According to Hindu doctrine there are ten classes of such beings, the first seven of which are demons created aboriginally with the world or by acts of the higher gods on whom they wait as attendants or servants receiving some share of their worship, and avenging any omission or neglect of ceremonies due. Though not invariably, they are for the most part evilly-disposed towards human kind. But the last three classes of whom the paper more particularly treated, are exclusively of human origin, being malignant discontented individuals, wandering in an intermediate state between a heaven and a hell, intent upon mischief and annoyance to mortals, chiefly by means of possession and wicked inspiration, every aspect of which ancient ideas as well as of the old doctrine of transmigration they exemplify and illustrate. They are known by the name of Bhūta. The author went on to show how most of the evils and misfortunes of life were attributable to the Bhūta influence; death from violence, evil possession, diseases in families and in cattle, stone throwing, &c. He then described the priestly use of those supposed powers, the cure of diseases, the conduct of festivals, and dances. It was also pointed out how close was the similarity between the occurrences under Bhūta influence and the prevalence of a belief among European nations in witchcraft, demoniacal possessions, "levitations," ghosts, invisible powers, dancing manias, and the like. The Bhūta emblems and ceremonies were also described and compared with those of the Todas and other hill tribes. The paper contained accounts of several well authenticated trials consequent on Bhūta interference and punishment. A series of Bhūta (Turanian) gods was exhibited by the author as illustrative of the wide difference between Turanian and Aryan art.—Mr. Groom Napier read a paper on the localities whence the tin and gold of the ancients were derived; and a paper by Mr. Bertram F. Hartshorne on the Weddas of Ceylon, was also read.

Royal Microscopical Society, Nov. 24.—The president, Mr. H. C. Sorby, F.R.S., described and exhibited his new contrivance for measuring the position of the absorption bands in spectra. The new apparatus and its principle of action may thus be described:—When polarised light passes along the line of the principal axis of quartz, it does not suffer double refraction and depolarisation, but *circular* polarisation. The result is that when the quartz is $1\frac{1}{2}$ inch thick, and placed between two Nicol's prisms, the spectrum of the light transmitted through it exhibits seven well defined black bands, which gradually move up or down the field of the spectrum on rotating one of the Nicols, returning to the same place at each half-revolution. In order to make use of this property in measuring the wave-lengths of different parts of any spectrum, the lower Nicol is permanently fixed in a mounting connected with an ivory circle, each half of which is divided into ten large divisions, and these again into five smaller, so that it is easy to read off to the $\frac{1}{100}$ part of a half revolution. This of course corresponds to $\frac{1}{100}$ of the intervals between any two of the seven bands. Placing the circle at the zero point, the other Nicol's prism can be rotated until the bright line of sodium is all but invisible in the centre of total interference of the second band, counting from the red end. The position of all the other bands is then also definite and constant. By using a diffraction spectroscopic the wave-lengths of all the bands and of each $\frac{1}{10}$ interval can be calculated and arranged in a table and the smaller intervals can be filled up by interpolation. There is then no difficulty in determining the wave-length of the centre of any well-marked absorption band seen in the spectrum of any substance which is compared side by side with that of the quartz; for which purpose the binocular form of apparatus described by Mr. Sorby is the most convenient. The number of the band counting from the red end is easily seen, and the fractional interval is easily measured by rotating the ivory circle until the centres of the bands are made to exactly coincide. In the case of well-marked absorption-bands consecutive readings differ by only what is equivalent to one-millionth of a millimetre of wave-length, and the means of several observations differ considerably less than that. By proper attention to the illumination of both spectra there appears to be no serious difficulty in measuring the position of well-defined absorption-bands to within one-millionth of a millimetre of wave-length, which is quite as near as appears to be necessary in the case of the spectra for which the instrument is designed.

Geologists' Association, Dec. 3.—Mr. Wm. Carruthers, F.R.S., president, in the chair.—On quartz, chalcedony, agate, flint, chert, jasper, and other forms of silica geologically consi-

dered, by Prof. T. Rupert Jones, F.R.S. After noting a few of the salient mineralogical features of quartz, pointing out the difference in specific gravity between fused quartz (2.2) and ordinary quartz (2.6), the author passed on to chalcedony, which bears a similar relation to quartz that barley-sugar does to sugar-candy. No definite crystallised structure can be observed; but a fibrous appearance may generally be noted, at right angles to the planes of deposit, which latter often render the mass flaky. In some specimens this fibrous structure gradually becomes stronger, close-set, minute, crystalline prisms being visible in the fracture, and these pass into regular quartz crystals. The sub-crystalline structure of chalcedony is not yet thoroughly worked out. On account of the unequal resistance of some chalcedonies in agates to the action of hydrofluoric acid, by which certain layers are eaten away, cut agates have been prepared in slabs which take printer's ink and give impressions of their concentric structure, and of the channels of infiltration (See Transact. R. Acad. Vienna, &c.). Speaking of the formation of the angles in "fortification-agates," the author was inclined to accept the hypothesis of the chalcedonic silica having replaced calcite or a zeolite; a portion of an agate, comprising flat transverse layers of chalcedony, with quartz and calcite, being exhibited in illustration. The porous nature of agates, and the facilities thus afforded for the absorption of colouring matter, artificially introduced, were alluded to as connected with the minute prismatic structure. The properties of flint are somewhat different; it is less translucent, more conchoidal in fracture, and never fibrous in structure. Aggregations of silica were stated to be present in every limestone, either in the form of common flint or as hornstone, or some variety of chert, and were regarded by the author as being due to the replacement of carbonate of lime by silica. But as this mineral rarely succeeds calcite (crystallised calcic carbonate) as a pseudomorph, it is only the amorphous, or detrital, carbonate of lime of the organisms constituting the limestone that becomes changed into, or replaced by, silica (as flint), and not the crystallised material of Echinodermatal structures (whether spines, plates, stems, or ossicles), nor of *Inoceramus*, *Ostrea*, *Terebratula*, &c. These latter, however, in some cases are replaced by *orbicular silex*. When such unchanged organisms are abundantly present in flint, or when they have left cavities after removal by water, or when other partially altered organisms abound in the flint, it appears coarse-grained and is called "chert." The fine calcareous detritus which filled the internal canal of encrinural stems, the perforations of echinite tests, the parasitical borings of oyster-shells and blemmites, the tubules of sponges, the cavities of sea-urchins, shells, foraminifera, &c., has been changed, atom by atom, into exquisite silicious casts of such hollows and interiors, and are exposed to light by the natural or artificial removal of the calcareous enclosure. In some beds of chalk the pseudomorphosis of the limestone has taken place near and around Sponges; elsewhere, without Sponges, large masses of Polyzoan Chalk have been silicified (France, Maestricht, &c.); also Orbitoidal and Nummulitic limestones (West Indies, Alps, &c.) Freshwater limestones (Paris, Asia Minor, &c.) Encrinural limestone (Carboniferous, Britain, and Tasmania). The white surface of a fresh chalkflint, of whatever shape it may be, shows by its rough subreticular surface, dotted with unchanged microzoa and fragments of shells, the extent of the creeping pseudomorphic change between the nodule and the matrix, and the replacement by silica has been through just so much chalk or other limestone as the nodule or tabular mass represents in size. Even some vertical flint-veins in chalk the author believes to consist of the two altered walls of a fissure, which has been traversed by water with silex in solution; for chalk fossils remain sometimes *in situ* in such vein flint. The author believed that in the south of England, at least, it is rare for sponge-structure to be itself converted into flint. This substance represents the calcareous mud filling the cavities of the sponge, the tissue having generally been lost, or remaining only as a ferruginous stain. Hollows in flints due to the removal of involved sponge-tissue have been lined, by infiltration, with either quartz-crystals or mammillary chalcedony. The specks, blotches, lines, and some other markings apparent on weathered flint, the author thinks, in many cases, arise from differences in the texture of the flint, due to the various organic substances inhabiting or buried in the calcareous mud now represented by pseudomorphic silex. Among such organisms, he suggests that the recent thread-like Foraminifera (*Botellina*, &c.) of the Atlantic ooze may have had their analogies in the Cretaceous mud, giving rise to some straight and cross-lined markings on the weathered surfaces of broken flint, and somewhat similar,

but raised, figures on the outside of nodules. Siliceous sinter, both stalagmitic and granular, resulting from hot siliciferous springs, as in Iceland, New Zealand, Colorado, &c., was next noticed; and it was suggested that some of the flint in the Purbeck "cap" at Portland may have been siliceous sinter. Hyalite and opal and its varieties were alluded to. The orbicular siliceous of "beckite" was exhibited, and referred to the deposition of silica around angular fragments of limestone, which at the same time it has replaced to some thickness. The origin of the "potato-stones," or siliceous geodes, in the Triassic beds of Somersetshire is similarly pseudomorphic. In some honestones we have extremely fine compact sand cemented by silica; thus approaching one of the two very different kinds of "chert;" other kinds belong to siliceous schists and altered argillaceous rocks. Jaspers the author was disposed to view, for the most part as altered argillaceous rocks; though some are opaque chalcedonies. Beds of shell and clay may be traced into iron-flint (Eisenkiesel) and other jaspery rocks. In Griqualand-west, South Africa, there are miles of bedded jaspers, highly contorted, varying in colour and character according to the nature of the original clays and sand-rocks, which were crushed and folded by lateral pressure, and altered by the accompanying hydrothermal agency (See G. W. Stow's sections). Such jaspers, lydites, and jaspery schists have great geological importance in many parts of the world, inasmuch they hold up the surface of the country by resisting denudation.

CAMBRIDGE

Philosophical Society, Nov. 15.—Mr. Trotter said that since reading his paper "On some Waterholes in the Gornier Glacier," his attention had been called to a passage in Agassiz (Nouvelles Etudes sur les Glaciers, Paris, 1847, p. 101), in which a similar phenomenon was described as having been first observed by Dr. F. Keller. There could be no doubt that the description in Agassiz referred to the same phenomenon as had been described by Mr. Trotter, and that therefore these holes had been first noticed by Dr. Keller, and described in 1847. Mr. Trotter however thought Dr. Keller's explanation of the phenomenon unsatisfactory, and adhered to his own as contained in the paper in question.—The following communications were made:—(1) By Mr. F. M. Balfour on the behaviour of Nucleus during Segmentation. The following observations were made upon the eggs of Scyllium and Pristiurus. At a late stage of the segmentation of these eggs most of the segments contain nuclei, but in some of them there is to be seen in the place of the nucleus a peculiar body. This has the shape of two cones with their bases in apposition. In each cone a series of striæ radiate from the apex to the base; and between the two is an irregular row of granules. From the apex of the cone there further diverge into the protoplasm of the cell a series of lines. The author regards these peculiar bodies as metamorphosed nuclei in the act of dividing. He points out that the simple division of the nucleus, as well as its complete disappearance, accompanied by the formation of two fresh nuclei, are well authenticated modes of behaviour of the nucleus during cell division. These two processes can only be connected on the supposition that in the second case the two fresh nuclei are formed from the matter of the old nucleus. The author considers that there exist in Selachians modes of behaviour of the nucleus intermediate between the two extremes mentioned above, and points out that in the peculiar striation of the body he described there are indications of the streaming out of its matter into the surrounding protoplasm; while on the other hand it never completely vanishes. It therefore affords an instance where part of the matter of the nucleus divides and part streams out into the protoplasm of the cell to be again collected to assist in the formation of two fresh nuclei. The author further states that he has found other bodies intermediate between the cone-like bodies mentioned above and true nuclei; and regards these also as nuclei in the act of division, where a still larger bulk of the protoplasm of the nucleus becomes divided and a smaller part rises with the surrounding protoplasm.—(2) By Mr. Foster, On the effects of Upas Antiar on the Heart. A summary of this paper will be found in the Proceedings of the Society.

PARIS

Academy of Sciences, Dec. 13.—M. Frémy in the chair.—The following papers were read:—On the laws of magnetic induction, by M. Jamin.—On the theory of refining of glass, by M. Frémy.—On the heat of dissolution of precipitates, and other little soluble substances, by M. Berthelot.—Researches on sulphines, by M. Cahours.—Atmospheric perturbations of

the hot season of 1875; inundations in the south of France, by M. Belgrand.—Note accompanying the presentation of micro-metric plates, for measurement of solar images, by M. Janssen.—Report on reclamations with reference to the decree given on request of the Governor of Algeria, concerning importation into Algeria of fruit and forest trees from France, by MM. Dumas, Blanchard, and others. The Commission think a line should be drawn through the points Phylloxera has reached in a northward direction, and that the exportation should be authorised of all plants accompanied with an authentic certificate stating they are from territory at least 40 to 50 kilometres north of this line.—On the temperature of elevated layers of the atmosphere, by M. Mendeleeff.—Exposition of a new method for the resolution of numerical equations of all degrees (first part), by M. Lalanne.—On destruction of the vegetable matter mixed with wool, by MM. Barral and Salvétat. They give lists of substances which destroy and those which do not destroy the vegetable fibre. The first action of the former is to remove part of the water from the fibre and carbonise it.—Researches on the constitution of fibroin and of silk, by MM. Schutzenberger and Bourgeois.—Comparative study of instantaneous and continuous electric currents in the case of uni-polar excitation, by M. Chauveau.—On a fish of the Lake of Tiberias, the *Chromis paterfamilias*, which incubates its eggs in the buccal cavity, by M. Lortet. The male fish sucks in the eggs from a sandy hollow (where the female has deposited them) and passes them in among the folds of his branchiæ, where they go through the usual stages.—Researches on the respiratory apparatus and mode of respiration of certain Brachyuran Crustaceans (land crabs), by M. Jobert.—Lithological examination of green chalk sand, by M. Meunier.—On the discussion of a system of simultaneous linear equations, by M. Meray.—On the calorific intensity of solar radiation and its absorption by the terrestrial atmosphere, by M. Crova.—On the action of flames in presence of electrified bodies, by M. Douliot.—Note on the sulphocyanates of the radicals of acids, by M. Miquel.—On the saccharification of amylaceous matters, by M. Bondonneau.—Influence of stripping off the leaves, on the weight and saccharine richness of beet, by MM. Champion and Pellet.—On the embryogeny of Tunicata of the group of Lucæ, by M. Giard.—Meteorological observations in a balloon, by M. Tissandier. This voyage was made on Nov. 29. At 1,500 m. a remarkable bank of ice-crystals (in whirling motion) was passed through. The balloon rose to 1,776 m., and from about 1,100 m. upwards, a rise of temperature was observed.

BOOKS AND PAMPHLETS RECEIVED

BRITISH.—A Brief Account of Bushman Folk Lore: W. H. J. Bleek, Ph.D. (Trübner).—Euclid Simplified: J. R. Morell (H. S. King).—Map of India. To illustrate the Travels of H.R.H. the Prince of Wales (W. and A. K. Johnston).—Botany for Schools and Science Classes: W. J. Browne, M.A. (Belfast, Mullin).—Gorilla Land and the Cataracts of the Congo: Capt. R. F. Burton (Sampson Low).—Explorations in Australia: John Forrest (Sampson Low).—List of Works on the Geology, &c., of Cornwall: W. Whitaker (Truro, J. R. Netherton).—The Geological Story briefly told: J. D. Dana (Trübner).—The History of Creation: Ernst Haeckel (H. S. King).—A Physician's Notes on Ophthalmology, and series: J. Hughlings Jackson, M.D.—The Natural History of Eugenia Viridis: E. Parfitt.—Tissandier's History and Handbook of Photography. Edited by J. Thompson, F.R.G.S. (Sampson Low).

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